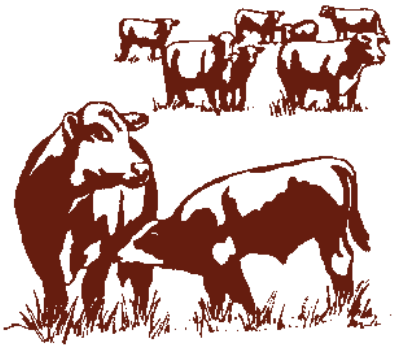
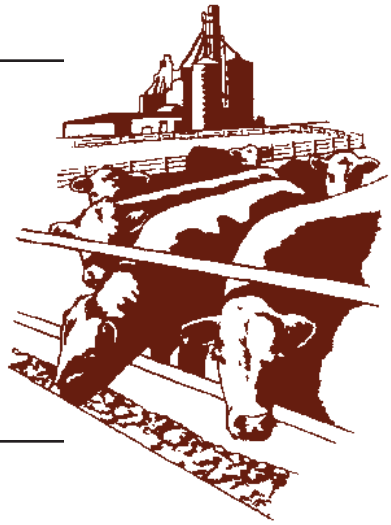


Beef Cattle Handbook



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Pricing Protein and Energy Supplements

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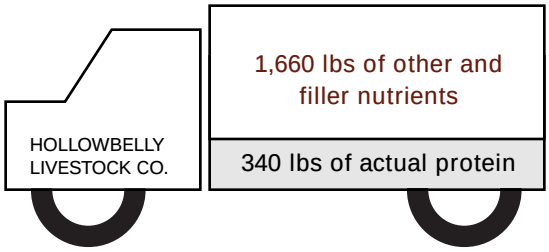
"You can't starve the profit out of a cow!" Most grass hays fall short of meeting the nutrient requirements of a mature cow or replacement heifer in their last trimester of pregnancy and 3 - 4 months postpartum. Protein and energy supplementation is essential during this period of time to ensure conception of the cow or heifer, increase weaning percent, and to achieve heavier weaning weights. Choosing an economical protein or energy supplement is simplified when comparing products on a per pound of actual nutrient basis. This fact sheet explains how to go supplement shopping with a least-cost ration formulation in mind.

Pricing Method

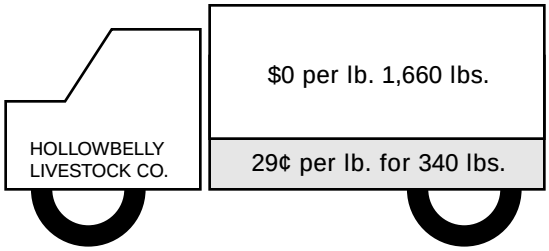
Supplements should not be compared by cost per ton as this is very misleading. When nutrient shopping, you are interested in primarily one or two ingredients (protein or energy). Mineral requirements can be met by using a less expensive free choice salt/mineral program. Additionally, you may be paying high prices for cheaper ingredients used as fillers. When comparing supplements for specific nutrients, the following guidelines assist in determining the best buy.

Step 1. Determine the total pounds of a nutrient in one ton (2,000 pounds) of feed. Do this by multiplying 2,000 pounds by the percent of the nutrient contained in that feed. For this example, let's use a 17 percent crude protein (CP) alfalfa hay (2,000 pounds x .17 percent CP = 340 pounds of actual protein). This leaves 1,660 pounds of other nutrients and filler contained in that ton of feed (2,000 pounds - 340 pounds of actual protein = 1,660 pounds).

Step 1. Determine total pounds of a nutrient in one ton of feed. 2,000 lbs. of 17 percent CP alfalfa hay (2,000 lbs. x 17CP = 340 lbs.).



Step 2. Determine cost per pound of actual nutrient. Do this by dividing the ton price of feed by the pounds of actual nutrient contained in that ton ($100 per ton divided by 340 lbs. of protein = 29¢ per lb.).



Step 2. Determine cost per pound of actual nutrient. 2,000 lb of 17% CP alfalfa hay ($100 per ton ÷ 340 lb of protein = 29¢ per lb).

In the example above, $100 of alfalfa hay with a protein content of 17 percent has a price comparison shopping value of 29¢ per pound of actual protein.

Table 1. Rules for NPN utilization.

Conditions	Utilization % Dry supplement	Liquid supplement
Weathered grass Crop residues Poor quality hay	0 to 25	25 to 50
Medium quality hay Silages	40 to 60	60 to 80
Summer pasture High energy rations	90 to 100	90 to 100

WARNING:
0.13 to 0.23 g urea per pound of body weight = toxic;
0.45 to 0.68 g urea per pound of body weight = lethal

Cost of Protein

Protein supplements are probably the most difficult supplements to evaluate because you must distinguish between natural protein and nonprotein nitrogen (NPN), bypass protein and ruminal degradable protein, and dry vs. liquid. Urea, biuret, and other forms of NPN do not equal natural protein. The extent to which NPN is utilized is dependent on a number of factors including the energy content (especially starches from cereal grains) of the diet, the quality of the available forage, and whether the NPN is in a liquid or dry supplement. Nutritionists agree that NPN sources should not exceed one-third the total protein requirements of the animal.

Many nutritionists recommend subtracting the amount of protein contributed by NPN sources when comparing supplements. For example, if the supplement contains 32 percent crude protein of which seven percent is from NPN then 32 - 7 = 25 percent natural protein. Another method of price comparison is to include only that portion of the NPN that can be utilized by the ruminant (Table 1). Add that amount to the natural protein content of the supplement. For comparison purposes, in this paper subtract the NPN from the natural protein sources.

Table 2 shows price comparisons on a per pound of actual natural protein basis of supplements commonly available to livestock producers. In this example 17 percent crude protein alfalfa hay at a cost of $100 per ton was the most economical protein supplement. The 29¢ cost per actual pound of protein was nine cents cheaper than its closest competitor. Producers could afford to pay up to $134 per ton for alfalfa hay before the other feeds become price competitive on a per pound of natural protein basis.

Quality of Natural Protein

Feed salesmen may promote their supplements on the basis of "quality" of protein and other ingredients. In ruminant rations the quality of protein has little meaning, because ruminants break down the protein in the feed, then reassemble it.

Table 2. Comparison of Feeds on a Per Pound of Actual Natural Protein Basis.*

Feed	$/ton	% natural CP	% NPN	Pounds CP/ton	$/lb.
Alfalfa hay	$100	17	0	340	0.29
Alfalfa hay	$134	17	0	340	0.39
20% range cube	$138	18	2	360	0.38
Wheat mid pellet	$168	16	0	320	0.53
20% range block	$155	13	7	260	0.60
25% molasses lick or tub	$378	19	6	380	0.99

**Percent utilization of NPN as a protein source on high roughage low quality feeds is dependent on the energy content of the supplement. For this price comparison example we are using natural protein sources only.*

Table 3. Comparison of Feeds on a Per Pound of TDN.

Feed	$/ton	% TDN	Pounds TDN/ton	$/lb. TDN	
Alfalfa hay	$100	58	1,160	0.086	Alfalfa
hay	$134	58	1,160	0.116	20% range
cube	$138	80	1,600	0.086	Wheat mid
pellet	$168	79	1,580	0.106	20% range
block	$155	72	1440	0.108	25%
Molasses lick or tub	$378	80	1,600	0.236	

Cost of Energy (TDN)

Table 3 shows cost comparisons for energy on a per pound of actual nutrient basis using the same feeds shown in the preceding table. Alfalfa loses some of its competitive edge when energy is the nutrient of choice. The range cube priced at $120 per ton or 86¢ per pound of TDN is equal in value to alfalfa if you were only considering energy. Alfalfa priced at $100 per ton remains your feed of choice, particularly if the ration required protein as well as energy.

Table 4 is a quick reference to compare supplements based on price quotes and protein content. Remember to subtract the NPN portions of protein percentage before determining the price of protein on a per pound of actual nutrient basis. It's also a good idea to add transportation costs into the per ton feed costs before calculations.

How Much Protein and Energy Do I Need?

Forage testing should be performed on homegrown feeds to remove the guess work on forage quality and minimize supplemental feed costs. The cost of forage testing is minimal compared to the cost of most protein and/or energy supplements. One can determine the supplemental needs to balance a ration through a mathematical process of matching a cow's nutritional needs to the nutrition content of feeds. Several computer programs are available that balance rations on a least-

cost basis. Ask the Extension educator in your county for assistance.

Table 4. Cost Per Pound of Protein. Percent Crude Protein (CP) (Use all natural protein only, subtract out NPN percentage before comparing prices).

Price of feed per ton	15%	20%	25%	30%	35%
	(Cost per pound of protein in cents)				
$50.00	16.7	12.5	10.0	8.3	7.1
$55.00	18.3	13.8	11.0	9.2	7.9
$60.00	20.0	15.0	12.0	10.0	8.6
$65.00	21.7	16.3	13.0	10.8	9.3
$70.00	23.3	17.5	14.0	11.7	10.0
$75.00	25.0	18.8	15.0	12.5	10.7
$80.00	26.7	20.0	16.0	13.3	11.4
$85.00	28.3	21.3	17.0	14.2	12.2
$90.00	30.0	22.5	18.0	15.0	12.9
$95.00	31.7	23.8	19.0	15.8	13.6
$100.00	33.3	25.0	20.0	16.7	14.3
$105.00	35.0	26.3	21.0	17.5	15.0
$110.00	36.7	27.5	22.0	18.3	15.7
$115.00	38.4	28.7	23.0	19.2	16.5
$120.00	40.0	30.0	24.0	20.0	17.2
$125.00	41.7	31.3	25.0	20.8	17.9
$130.00	43.3	32.5	26.0	21.7	18.6
$135.00	45.0	33.8	27.0	22.5	19.3
$140.00	46.7	35.0	28.0	23.3	20.0
$145.00	48.3	36.3	29.0	24.2	20.7
$150.00	50.0	37.5	30.0	25.0	21.4
$155.00	51.7	38.8	31.0	25.8	22.1
$160.00	53.3	40.0	32.0	26.7	22.9
$165.00	55.0	41.3	33.0	27.5	23.6
$170.00	56.7	42.5	34.0	28.3	24.3
$175.00	58.3	43.8	35.0	29.2	25.0
$180.00	60.0	45.0	36.0	30.0	25.7
$185.00	61.7	46.3	37.0	30.8	26.4
$190.00	63.3	47.5	38.0	31.7	27.1
$195.00	65.0	48.8	39.0	32.5	27.9
$200.00	66.7	50.0	40.0	33.3	28.6
$300.00	$1.00	75.0	60.0	50.0	42.9
$400.00	$1.33	$1.00	80.0	66.7	57.1

Note: Not all values can be included in the table. Find the closest ones and then make adjustments between values.

Importance of Forage Quantity

Cattle require quantities of nutrients not percentages of nutrients. The percentages of nutrients needed to balance the rations in this fact sheet will be incorrect when the amount of feed is less or more than the quantity required. Cattle can suffer from "hollowbelly" when insufficient forage is fed no matter what the forage nutrient density. Generally, an animal's dry matter intake ranges from 1.5 - 3 percent of body weight depending on the forage quality. The higher the forage quality, the greater the intake. Also, it is important to remember that environmental conditions often create the need for additional forage intake during winter months.

More To Consider Than Price Alone

Factors other than price must be considered when supplement shopping:

- Convenience and feedability—feeding blocks or tubs every 3-4 days vs. hay or pellets every day
- Transportation cost of getting feed to the ranch and storage facilities at the ranch
- Cost of feeding the product
- Availability of the product
- Consumption amount required to balance the ration,
- Other nutrients required to balance the ration
- Waste
- Salt and mineral content
- Competition when fed (bunk space)
- Opportunity to medicate feed
- Worn and broken teeth on blocks

References

National Research Council. 1984. Nutrient requirements of beef cattle (6th Ed). National Academy Press, Washington, DC.

National Research Council. 1985. Ruminent nitrogen usage. National Academy Press, Washington, DC.

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